



PFC Device Corporation

## PRM012N04S8

### 40V Single N-Channel MOSFET

#### Major ratings and characteristics

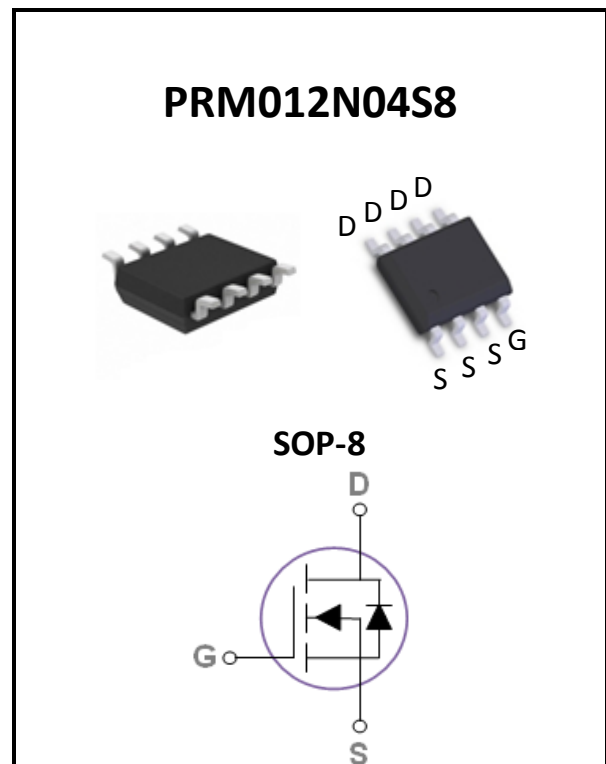
| Characteristics                          | Values      | Units            |
|--|-------------|------------------|
| $V_{DS}$                                 | 40          | V                |
| $I_D$ ( $T_A=25^\circ\text{C}$ )         | 10.7        | A                |
| Max. $R_{DS(ON)}$ @ $V_{GS}=10\text{V}$  | 12          | m $\Omega$       |
| Max. $R_{DS(ON)}$ @ $V_{GS}=4.5\text{V}$ | 17          | m $\Omega$       |
| $T_J$ Operating Junction Temperature     | -55 to +150 | $^\circ\text{C}$ |

#### General Description

The N-Channel enhancement mode power field effect transistor is using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. The device is well suited for high efficiency fast switching applications.

#### Typical Applications

- Charger Adapter
- Power Tools
- LED Lighting



#### Features

- Max.  $R_{DS(ON)}=12\text{m}\Omega@V_{GS}=10\text{V}$
- Improved dv/dt capability
- Fast switching
- 100%  $E_{AS}$  Guaranteed
- Green Device Available

## 1. Characteristics

### Maximum Ratings Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified )

| Symbol    | Parameter  | Rating     | Units               |
|-----------|--|------------|---------------------|
| $V_{DS}$  | Drain-Source Voltage                                   | 40         | V                   |
| $V_{GS}$  | Gate-Source Voltage                                    | $\pm 20$   | V                   |
| $I_D$     | Drain Current – Continuous ( $T_A=25^\circ\text{C}$ )  | 10.7       | A                   |
|           | Drain Current – Continuous ( $T_A=100^\circ\text{C}$ ) | 6.7        | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                    | 42.8       | A                   |
| $E_{AS}$  | Single Pulse Avalanche Energy <sup>2</sup>             | 5          | mJ                  |
| $I_{AS}$  | Single Pulse Avalanche Current <sup>2</sup>            | 10         | A                   |
| $P_D$     | Power Dissipation ( $T_A=25^\circ\text{C}$ )           | 2.5        | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$    | 0.02       | W/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                              | -55 to 150 | $^\circ\text{C}$    |
| $T_J$     | Operating Junction Temperature Range                   | -55 to 150 | $^\circ\text{C}$    |

### Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit                      |
|-----------------|--|------|------|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient | ---  | 50   | $^\circ\text{C}/\text{W}$ |



## Electrical Characteristics ( $T_J = 25^\circ\text{C}$ unless otherwise specified )

### Off Characteristics

| Symbol     | Parameter                      | Conditions                                     | Min. | Typ. | Max.      | Unit    |
|------------|--------------------------------|--|------|------|-----------|---------|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$                      | 40   | ---  | ---       | V       |
| $I_{DSS}$  | Drain-Source Leakage Current   | $V_{DS}=40V, V_{GS}=0V, T_J=25^\circ\text{C}$  | ---  | ---  | 1         | $\mu A$ |
|            |                                | $V_{DS}=40V, V_{GS}=0V, T_J=125^\circ\text{C}$ | ---  | ---  | 250       | $\mu A$ |
| $I_{GSS}$  | Gate-Source Leakage Current    | $V_{GS}=\pm 20V, V_{DS}=0V$                    | ---  | ---  | $\pm 100$ | nA      |

### On Characteristics

|              |                                   |                               |     |     |     |            |
|--------------|-----------------------------------|-------------------------------|-----|-----|-----|------------|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10V, I_D=5A$          | --- | --- | 12  | m $\Omega$ |
|              |                                   | $V_{GS}=4.5V, I_D=3A$         | --- | --- | 17  | m $\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.0 | --- | 3.0 | V          |
| $g_{fs}$     | Forward Transconductance          | $V_{DS}=5V, I_D=5A$           | --- | 19  | --- | S          |

### Dynamic and switching Characteristics

|              |                              |  |     |      |     |          |
|--------------|------------------------------|--|-----|------|-----|----------|
| $Q_g$        | Total Gate Charge            | $V_{DS}=20V, V_{GS}=10V, I_D=10.7A$              | --- | 24   | --- | nC       |
| $Q_{GS}$     | Gate-Source Charge           |  | --- | 4.5  | --- |          |
| $Q_{GD}$     | Gate-Drain Charge            |  | --- | 4    | --- |          |
| $T_{d(on)}$  | Turn-On Delay Time           | $V_{DD}=20V, V_{GS}=10V, R_G=6\Omega, I_D=10.7A$ | --- | 11   | --- | ns       |
| $T_r$        | Turn-On Rise Time            |  | --- | 56   | --- |          |
| $T_{d(off)}$ | Turn-Off Delay Time          |  | --- | 29   | --- |          |
| $T_f$        | Turn-Off Fall Time           |  | --- | 55   | --- |          |
| $C_{iss}$    | Input Capacitance            | $V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$           | --- | 1390 | --- | pF       |
| $C_{oss}$    | Output Capacitance           |  | --- | 100  | --- |          |
| $C_{rss}$    | Reverse Transfer Capacitance |  | --- | 75   | --- |          |
| $R_g$        | Gate resistance              | $V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$            | --- | 2    | --- | $\Omega$ |

### Drain-Source Diode Characteristics

|            |                               |                             |     |     |     |    |
|------------|-------------------------------|-----------------------------|-----|-----|-----|----|
| $V_{SD}^3$ | Source to Drain Diode Voltage | $V_{GS}=0V, I_S=10.7A$      | --- | --- | 1.5 | V  |
| $t_{rr}$   | Reverse Recovery Time         | $I_S=10A, di/dt=100A/\mu s$ | --- | 7   | --- | ns |
| $Q_{rr}$   | Reverse Recovery Charge       |                             | --- | 1   | --- | nC |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $L=0.1\text{mH}, R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
3. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .



2. Characteristics Curves

Ratings and Characteristics Curves

(  $T_A = 25^{\circ}\text{C}$  unless otherwise specified )

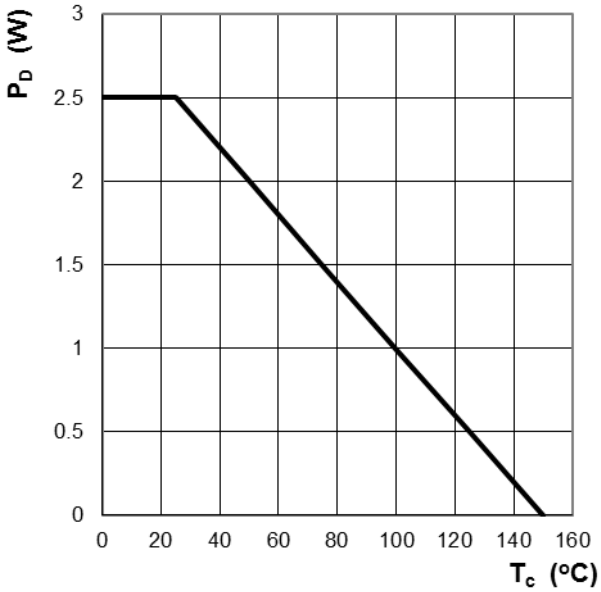


Figure 1: Power Dissipation

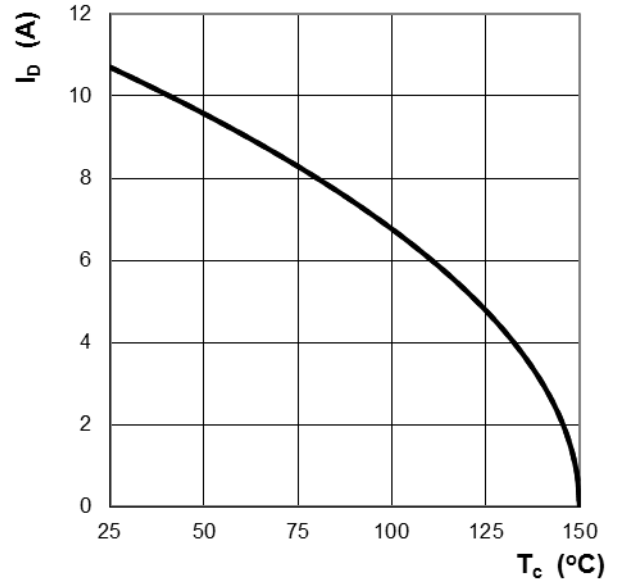


Figure 2: Continuous Drain Current vs.  $T_c$

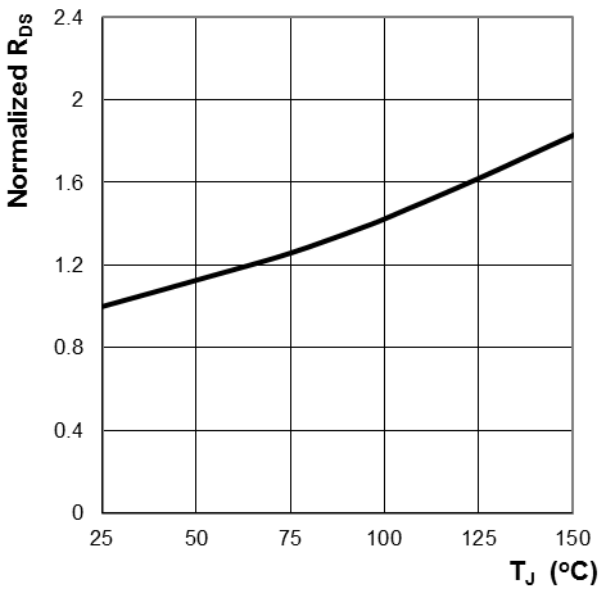


Figure 3: Normalized  $R_{DS(on)}$  vs.  $T_j$

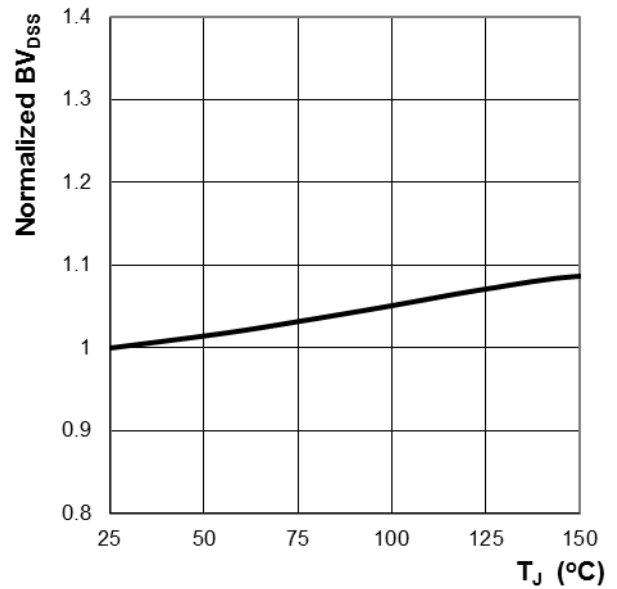


Figure 4: Normalized  $BV_{DSS}$  vs.  $T_j$



Ratings and Characteristics Curves

(  $T_A = 25^\circ\text{C}$  unless otherwise specified )

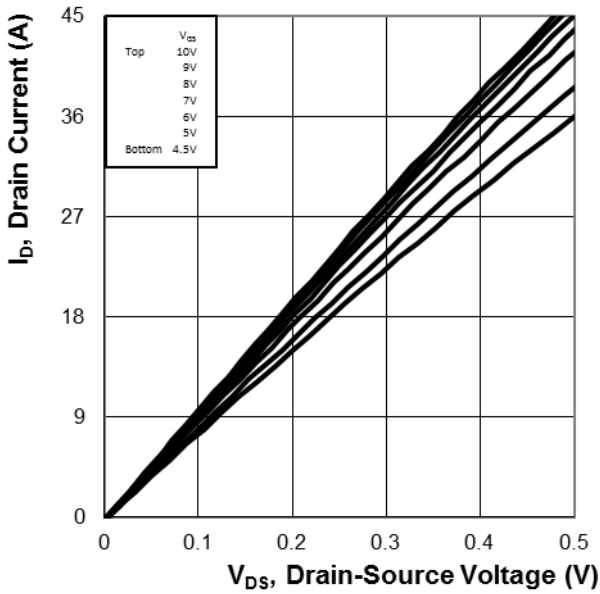


Figure 5: On-Region Characteristics

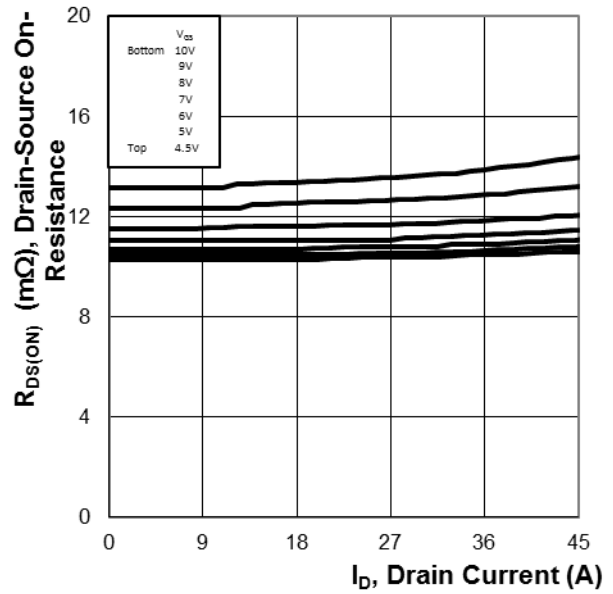


Figure 6: Typ.  $R_{DS}$  Variation vs.  $I_D$  and  $V_{GS}$

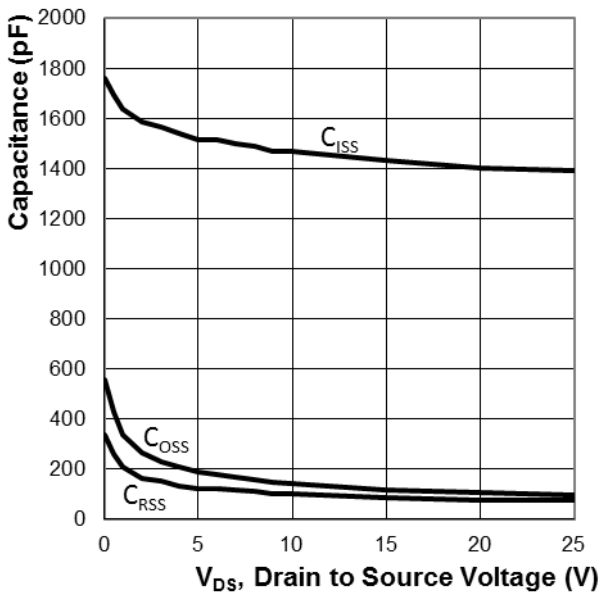


Figure 7: Typ. Capacitance Characteristics

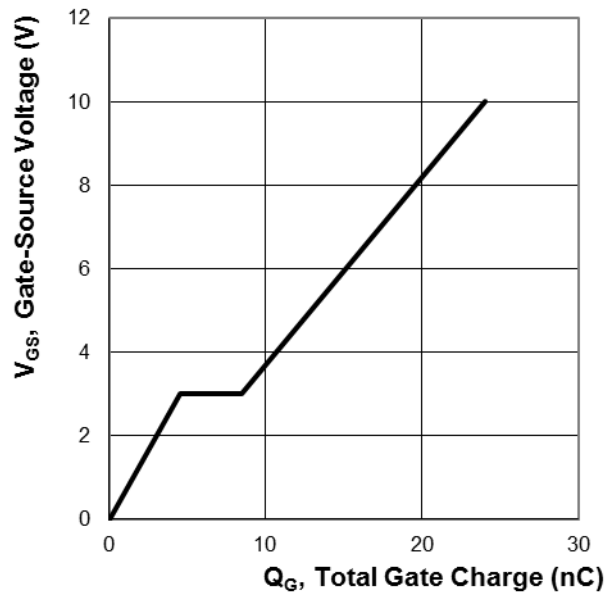


Figure 8: Typ. Gate Charge Characteristics



Ratings and Characteristics Curves

(  $T_A = 25^\circ\text{C}$  unless otherwise specified )

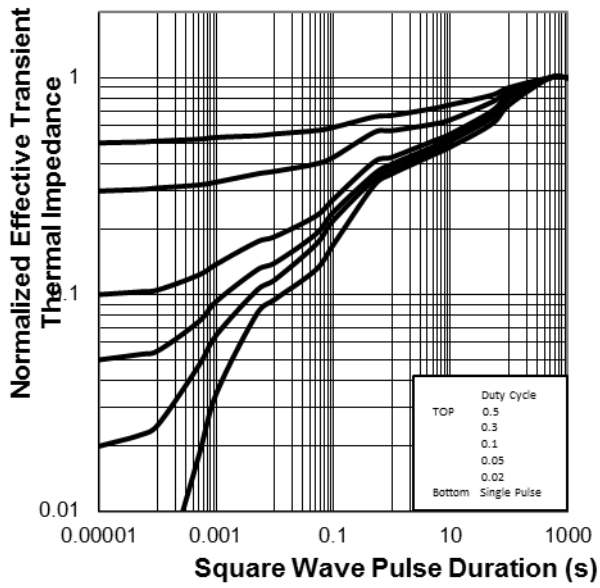


Figure 9: Normalized Thermal Transient Impedance, Junction-to-Case

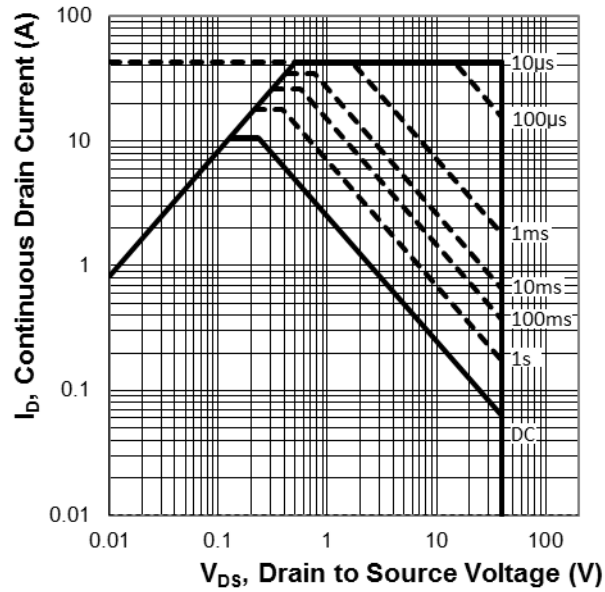
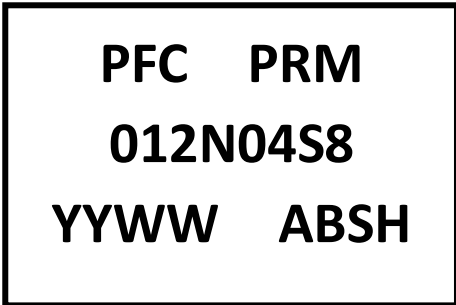


Figure 10: Maximum Safe Operation Area



**3. Marking information**

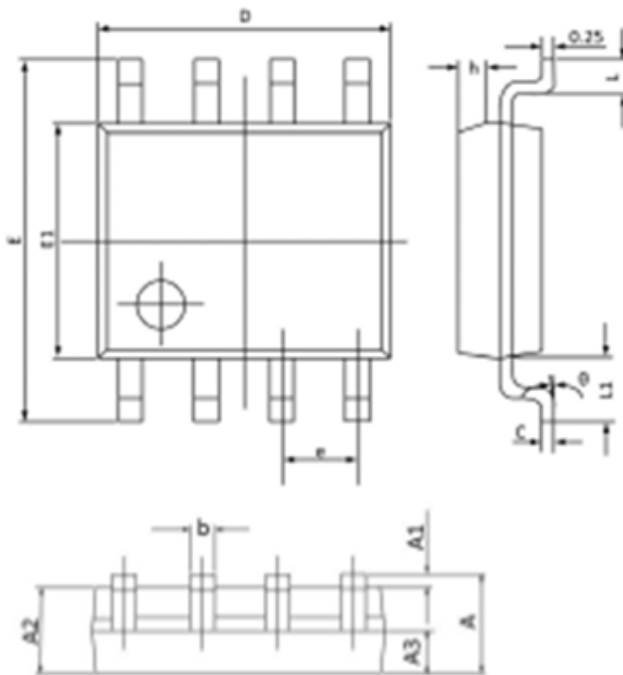
Top Marking Rule



PRM012N04S8 = Product Type Marking Code  
 YYWW = Date Code  
 YY = Last two digits of year  
 WW = Week code  
 ABS = Assembly code  
 H = Halogen Free (N/A = common molding compound)

**4. Package information**

Package Outline Dimensions millimeters



| Dim.                        | Min.     | Max. |
|-----------------------------|----------|------|
| A                           | 1.35     | 1.75 |
| A1                          | 0.10     | 0.25 |
| A2                          | 1.30     | ---  |
| A3                          | 0.60     | 0.70 |
| b                           | 0.35     | 0.49 |
| c                           | 0.18     | 0.26 |
| D                           | 4.70     | 5.10 |
| E                           | 5.80     | 6.20 |
| E1                          | 3.70     | 4.10 |
| e                           | 1.27 BSC |      |
| h                           | 0.25     | 0.50 |
| L                           | 0.40     | 0.90 |
| L1                          | 1.05 BSC |      |
| $\theta$                    | 0°       | 8°   |
| <b>All Dimensions in mm</b> |          |      |



**5. Ordering information**

| Part Number | Package | Delivery mode                |
|-------------|---------|------------------------------|
| PRM012N04S8 | SOP-8   | 3000 pcs / 13" diameter reel |

Mechanical

- Molder Plastic: UL Flammability Classification Rating 94V-0
- Device Weight : 0.003 ounces (0.085grams) – SOP-8

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